Appendix G: Federal Correctional Institution—Phoenix Case Study: NIST BLCC Comparative Economic Analysis

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* N I S T B L C C: COMPARATIVE ECONOMIC ANALYSIS (ver. 4.4-97) *

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Project: FCI PHOENIX-SOLAR WATER HEATING
Basecase: Electric Resistance Water Heating System
Alternative: Parabolic Trough Solar Water Heating System with Electric Resistance Backup Subsystem

Principal Study Parameters

Analysis Type:	Federal Analysis—Energy Conservation Projects
Study Period:	20.00 Years (AUG 1997 through JUL 2017)
Discount Rate:	3.4% Real (exclusive of general inflation)
Basecase LCC File:	FCINOSOL.LCC
Alternative LCC File:	FCISOL.LCC

Comparison of Present-Value Costs

	Base Case: Electric Res. System	Alternative: Parabolic Trough System	Savings from Alt.
Initial Investment item(s):			
Capital Requirements as of Service Date	$0	$650,000	-$650,000
Subtotal	$0	$650,000	-$650,000
Future Cost Items:			
Annual and Other Recurring Costs	$143,419	$226,891	-$83,473
Energy-related Costs	$1,528,397	$290,465	$1,237,932
Residual Value at End of Study	$0	$0	$0
Subtotal	$1,671,816	#517,356	$1,154,460
Total Present Value of Life-Cycle Cost	$1,671,816	$1,167,356	$504,460

Net Savings from Alternative ‘Parabolic Trough System’ compared to Basecase ‘Electric Resistance System’

Net Savings = P.V. of Noninvestment Savings	$1,154,460
- Increased Total Investment	$650,000
Net Savings:	$504,460

Note: the SIR and AIRR computations include differential initial costs, capital replacement costs, and residual value (if any) as investment costs, per NIST Handbook 135 (Federal and MILCON analyses only).

Savings-to-Investment Ratio (SIR) For Alternative ‘Phoenix-with Solar’ compared to Base Case ‘Phoenix-No Solar’

$$SIR = \frac{\text{P.V. of non-investment savings}}{\text{Increased total investment}} = 1.78$$

Adjusted Internal Rate of Return (AIRR) for Alternative ‘Parabolic Trough System’ compared to Base Case ‘Electric Resistance System’ (Reinvestment Rate = 3.40%; Study Period = 20 years)

AIRR = 6.41%

Estimated Years to Payback:
Simple Payback occurs in year 8;
Discounted Payback occurs in year 10

ENERGY SAVINGS SUMMARY

Energy Type	Units	Average Annual Consumption — Basecase	Alternative	Savings	Life-Cycle Savings
Electricity	kWh	1,768,000.0	336,000.0	1,432,000.0	28,640,000.0

EMISSIONS REDUCTION SUMMARY

Energy Type	Average Annual Emissions — Basecase	Alternative	Savings	Life-Cycle Savings
Natural Gas:				
CO_2 (Mg):	1,713.8	325.7	1,388.1	27,762.4
SO_2 (Kg):	5,971.3	1,134.8	4,836.5	96,729.9
NO_x (Kg):	5,162.8	981.2	4,181.6	83,632.7
Total:				
CO_2 (Mg):	1,713.8	325.7	1,388.1	27,762.4
SO_2 (Kg):	5,971.3	1,134.8	4,836.5	96,729.9
NO_x (Kg):	5,162.8	981.2	4,181.6	83,632.7

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